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FINAL REPORT

EVALUATION OF NEW VEGETABLE CROPS AND CULTIVARS FOR ADAPTATION TO SASKATCHEWAN

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Evaluation of New Vegetable Crops and Cultivars for Adaptation to Saskatchewan

Abstract : Cultivar testing represents a highly efficient means of maintaining and/or improving yields, quality and profitability of all crops, but is particularly beneficial in vegetable crops. The rate at which plant breeders are improving vegetable crops is dramatic. Over the three cropping seasons covered by this study (1998-2000) more than 900 cultivars from 26 different crops of importance to Saskatchewan's vegetable sector were evaluated at irrigated and dryland sites for their agronomic performance and consumer appeal. Storage and processing trials were conducted on some crops. The cultivar recommendations generated from this program have been made available to Saskatchewan's growers and stakeholders associated with the industry (seed suppliers, extension personnel) via publications and numerous presentations.

Background

Each year, thousands of new vegetable cultivars are released from seed companies and public research institutions around the world. These new cultivars provide the potential for increased yields, quality and pest resistance. At the same time, changing production practices, pest pressures, economic conditions and environmental constraints alter the performance requirements of vegetable cultivars. Cultivars which were once the industry standard soon become obsolete due to these rapid changes. Cultivar screening trials represent an opportunity to match the breeders' achievements with the needs of both the grower and the consumer.

Vegetable cultivar testing trials have been on-going in Alberta and Manitoba for many years. These trials have brought to the growers an awareness of the cultivars which perform well under local growing conditions, and has contributed to the expansion of vegetable production in those provinces.

In Saskatchewan, vegetable cultivar trials have been conducted since 1986 by the Horticulture Department at the University of Saskatchewan through funding provided by the ERDA Horticultural Development Program and by the Agriculture Development Fund.

This project represents the continuation of Saskatchewan's vegetable cultivar testing program.

Project Objectives

To examine newly released cultivars of vegetable crops of commercial significance in Saskatchewan for their suitability and adaptation to Saskatchewan growing conditions, commercial production practices and market demands. New releases are compared to the industry standards in side by side trials at two or more locations across the province.

The specific objectives of the project are;

a) to continue and expand on the cultivar testing program established at the University of Saskatchewan;

b) to examine cultivar performance in relation to the differing soil, climate and production practices encountered in Saskatchewan;

c) to prepare a listing of recommended cultivars for Saskatchewan vegetable growers.

d) to inform Saskatchewan's vegetable growers, extension personnel, industry stakeholders and consumers about the attributes of the cultivars tested.

Methodology

The trials were conducted during the 1998-2000 cropping seasons at sites chosen to represent the regions, soil types and site profiles where vegetables are typically grown in Saskatchewan.

The sites were ;

Outlook site
- C.S.I.D.C. Farm
- sandy loam soil, pH 8.2
- little shelter
- overhead irrigation

Saskatoon site
- Univresity of Saskatchewan - Horticulture Science Field Station
- clay loam soil, pH 7.3
- well protected
- overhead and trickle irrigation

Nipawin site
- Sandy loam soil, pH = 7.4,
- Sheltered site, long-term vegetable rotation
- Overhead irrigation and dryland

We wish to thank C.S.I.D.C. and Rod Peterson (Grindstone Farms Nipawin) for their cooperation in hosting trial sites.

Cultivars were selected for testing based on their performance in previous trials, recommendations from other provinces, local growers, industry sources and seed companies. In all trials, the standard cutivars presently used by the industry were included a comparative checks.

The crops, number of cultivars tested and the crop characteristics evaluated over the three years covered in this report are listed below;

Crop	Cultivars Tested	Characteristics Measured
Basil	15	Plant form, leaf yields and quality
Beans (Yellow)	16	Stand %, yield, disease resistance
Beets	34	Stand %, root quality and flavor
Broccoli	6	Stand %, days to maturity, head quality
Cabbage	72	Stand %, days to maturity, head quality
Carrots	9	Stnad %, days to maturity, root quality

Cauliflower	6	Stand %, earliness, head quality
Celery	21	Earliness, yields, flavor, texture
Corn	66 early 79 main	Stand %, days to maturity, yields, cob characteristics
Cucumbers (Pickling)	24	Fruit yields and quality
Cucumbers (Slicing)	44	Earliness, yields, fruit quality
Garlic	9	Bulb yield and quality
Head Lettuce	24	Earliness, head quality
Romaine Lettuce	23	Stand %, head quality
Muskmelon	10	Earliness, yields, fruit quality
Onions	45 yellow 8 red 6 white	Stand %, bulb characteristics, yields
Onions - storage trial	44 yellow 6 red 6 white	% weight loss, sprouting, scale retention
Oriental Vegetables Choy, Greens, Daikon	44	Quality, yields, bolting
Parsnip	21	Root yield and quality
Hot Peppers	112	Earliness, yields, taste, pungency
Paste tomatoes	38	Yields, fruit quality
Snow Peas	20	Pod yield and quality, vine vigor
Watermelon	68	Earliness, yields fruit quality
Zucchini	33	Stand %, fruit yield and quality
Total Crops **Total Cultivars**	**26** **> 900**	

Production Practices

Crop production and pest control measures generally followed recommended practices. Soil fertility levels were adjusted according to the recommendations outlined in the Horticulture Science Publication: "Vegetable Crop Fertility Schedules" (ERDA Publication No. 88-3). All crops received a mid-season application of nitrogen either through the irrigation system or via side-dressing. Overhead or drip irrigation were used to maintain adequate soil moisture levels throughout the growing season at all sites. The Nipawin site had a dryland plot as well as an irrigated plot.

The beans, beets, corn, head lettuce, onions, oriental vegetables and snow peas were direct seeded in twin rows using a Planet Jr. type seeder. The garlic was hand planted in the spring and fall of 2000. The test rows for each cultivar were 6-8m in length depending on the crop and the site. Data was collected from the entire row for most crops.

The pickling and slicing cucumbers were seeded into IRT mulch at a rate of two seeds per hole and later thinned to one plant per hole. After seeding, cucumbers were covered with a P-17 crop cover. The covers were removed at the first sign of flowering.

Watermelon and cantaloupe were seeded into Jiffy 7's in the greenhouse and transplanted in the field into IRT mulch once the seedlings reached the first true leaf stage. Cantaloupe and watermelon were covered with clear-perforated plastic tunnels supported by galvanized metal hoops. Tunnels were removed in mid to late July once the weather had warmed and the crops had begun to flower.

The celery, paste tomatoes and hot peppers were grown from transplants produced in the University of Saskatchewan greenhouses into Sunshine Mix No. 4. A fertilizer solution of 20-20-20 was applied bi-weekly at the recommended rate. 4½ week old tomatoes and 5½ week old hot peppers were transplanted in the field into IRT mulch. Each test row consisted of 10 plants. Peppers were covered with P-17 crop cover supported by galvanized metal hoops. Pepper covers were removed in early July and replaced late in August for frost protection. Tomatoes were not covered. Seven - 10 week old celery was transplanted into the field in double 8m rows. No attempt was made top hill the celery rows - instead we relied on a dense plant stand to blanch the stalks. All transplants were watered in using a fertilizer solution of 10-52-10 mixed according to label directions.

In Saskatoon, the cucumbers, paste tomatoes, hot peppers, watermelon and cantaloupe were drip irrigated, while the other crops were irrigated using an overhead wheel move. All crops in Outlook were irrigated using solid set overhead irrigation.

The crops were harvested once or twice weekly, commencing once a significant portion of each test row had matured. When frost terminated a crop, the proportion of the crop remaining on the plant was also evaluated. All data are for marketable product, based on local grading standards.

Growing Season Reviews

1998 Growing Season

The 1998 growing season was excellent for irrigated vegetable production. An early dry spring warmed the soil and helped initiate early planting and germination. A hard late spring frost in Saskatoon set back some of the warm season crop seedlings. Cantaloupe, watermelon and corn recovered from the frost whereas many zucchini varieties had to be replanted. June was slightly cooler than average with less than average sunshine hours. Typical July weather issued in a hot, sunny August. September was warm however, precipitation was above average. A late killing frost in the fall ensured that the majority of the warm season crops reached full maturity.

An early, heavy snowfall on October 10 brought the majority of the 1998 growing season to a sudden halt. A complete snow melt and warmer temperatures allowed a final harvest of the cool season crops and root crops in late October.

1998 - WEATHER DATA						
	May	June	July	Aug.	Sept.	Season Ave.
	Mean Temperature (°C)					
Outlook	13.3	15.2	20.2	20.6	14.5	16.8
Saskatoon	13.0	14.5	18.7	20.0	13.3	15.9
Long-Term Average	11.2	15.6	18.4	17.2	11.5	13.1
	Sunshine Hours					
Outlook	n/a	n/a	n/a	n/a	n/a	n/a
Saskatoon	349	233	306	330	198	283
Long-Term Average	285	299	333	295	188	261
	Frost Free Season					
Outlook	May 13 to October 11 = 152 days					
Saskatoon	May 31 to September 30 = 123 days					
Long-Term Average	121 days					

Insects/Disease

A side band application of granular Furadan at planting time provided adequate early season flea beetle control for the cole crops. Flea beetles and cabbage loopers were a problem later in the season on all cole crops. Decis was sprayed at 10-14 day intervals from early July through to the end of the season for looper and flea beetle control. Consequently, loopers and flea beetles did not negatively affect crop yields or quality.

Black rot and tip burn were present in isolated areas throughout the cabbage plots at all sites. Some lettuce yields were reduced later in the season due to Drop (Sclerotinia). Corn ear worm was present in a few later corn cultivars in Saskatoon. Root maggot pressure was not as severe as in previous years.

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Yield/Quality

The excellent growing conditions in 1998 for irrigated vegetable crops enabled nearly all cultivars in all crops to completely mature. The watermelon, cantaloupe and melon harvests were both impressive and delicious: all cultivars produced marketable fruit and the majority of cultivars were completely finished by season end. Pickling cucumber yields and quality were excellent in 1998. Vines were extremely healthy producing an abundance of fruit.

Most zucchini cultivars were reseeded after the late spring frost. Some zucchini varieties were affected by blossom end rot and poor stands. The varieties with healthy plants produced excellent yields of good quality fruit. Several yellow zucchini varieties were grown: most of these yellow cultivars had excellent yields and quality.

Excellent spring weather enabled sweet corn to be planted earlier than usual. All corn varieties tested produced marketable cobs at an earlier harvest date than usual. Nearly all cultivars were completely finished by fall frost. Outlook corn matured earlier than normal. Romaine lettuce stands were excellent. Plants were thinned to encourage good head size. Cultivars were harvested in a once-over harvest. Quality and yields varied between cultivars. Earlier cultivars tended to have better quality as plants tended to become chlorotic later in the season.

Beet yields were variable. Stands in Saskatoon were variable: several cultivars appeared to be affected by herbicide drift. Existing plants were healthy with no visible above ground insect damage. Some varieties had some root maggot damage however, this damage did not influence yields. Onion yields were excellent at both sites. The long, warm growing season produced nice sized, high quality bulbs. A wet fall slowed top die-back. Consequently some bulbs resprouted prior to storage. An early planting date in addition to a long, warm season produced very good quality parsnips. Yields and quality between cultivars were comparable. Marketable yields were higher in Saskatoon than in Outlook for all cultivars.

Root maggot pressure was minimal in the cabbage trial. Heavy looper and flea beetle pressure was heavy kept in control with regular Decis spraying at 10-14 day intervals. Head quality was variable between cultivars: some cultivars had excellent head quality and yields. Several later cultivars did not mature during the growing season.

Six week old basil transplants were planted out in early June into black mulch. No attempt was made to deflower basil plants during the season. Plant and leaf quality were excellent for most culitvars. Plants were deleafed in a once over harvest at the end of the season.

The detailed data on performance of the various cultivars tested in 1998 are presented in the attached bulletin

1999 Season

1999- WEATHER DATA						
	May	June	July	Aug.	Sept.	Season Ave.
	Mean Temperature (°C)					
Outlook	10.8	15.2	17.0	18.3	11.2	14.5
Saskatoon	10.7	14.6	16.4	17.8	10.3	14
Long-Term Average	11.2	15.6	18.4	17.2	11.5	14.8
	Sunshine Hours					
Outlook	n/a	n/a	n/a	n/a	n/a	n/a
Saskatoon	185	264	3.8	267	231	250
Long-Term Average	285	299	333	295	188	280
	Frost Free Season					
Outlook	May 7 to September 13 = 129 days					
Saskatoon	May 7 to September 13 = 129 days					
Long-Term Average	121 days					

The 1999 cropping season was less than ideal for irrigated vegetable production. Although the frost free period was average, the mean temperature and total sunshine hours were below average. Warm temperatures early in May enabled field work and seeding to begin however, snow on May 11 ushered in a couple of weeks of cool weather. Above average rainfall for May, June and July coupled with cooler than normal temperatures slowed the growing season. All warm season crops including watermelon, hot peppers, cantaloupe, paste tomatoes and corn struggled to reach maturity. Temperatures in August were normal however sunshine hours were still slightly below normal. A severe fall frost occurred within one week of the average date bringing the 1999 growing season to an abrupt end.

Insects/Disease

With the exception of a few root maggots in the beet trial and corn earworms late in the corn season, insect problems were virtually non-existent in the vegetable cultivar trials. Early blight was present in some tomato cultivars however, it did not appear to adversely affect tomato yields. Some aster yellows was present in the celery however, it appeared to be cultivar specific.

Yield/Quality

The cool wet growing season of 1999 prevented many cultivars of the warm season crop from reaching maturity. With the exception of a few early cultivars, the watermelon and cantaloupe produced virtually no mature fruit. Most of the hot peppers produced marketable green fruit however mature red fruit were rare. Cucumber harvest was approximately 10 days later than average. Cucumber yields were only 30% of the 1998 average cucumber yield. Cucumber plants were nearly finished producing by frost. The cool temperatures and lower than average sunshine hour may have prevented bee pollination earlier in the season thereby slowing cucumber fruit production.

The paste tomatoes produced an abundance of green fruit however red fruit were virtually non existent. The large unmarketable tomato yields were due to undersize fruit. Corn harvest was delayed. Of the 90 cultivars tested, approximately 40% failed to reach 50% harvest.

The Saskatoon beet plot produced an excellent stand of marketable roots. Harvest was uniform and roots were of good quality. Beet emergence in Outlook was not uniform. A strip through the middle of the plot impeded plant germination and development. Consequently, each cultivar was harvested at several harvest dates in order to maximize size and yields. The cause for this poor production could not be determined. Overall, the onion trial produced quality bulbs of good size. Tops did not dry down well in the fall. Although onions were dried in air driers after harvest, skin set was only fair for many cultivars. Celery plots at both sites yielded excellent stalks of high quality produce. Other than some aster yellows, the celery cultivars were disease and insect free. Taste and quality were excellent.

The detailed data on performance of the various cultivars tested in 1999 are presented in the attached bulletin

2000 Growing Season

2000 - WEATHER DATA						
	May	June	July	Aug.	Sept.	Season Ave.
	Mean Temperature (°C)					
Outlook	11.4	14.9	19.2	17.4	12.7	15.1
Saskatoon	10.5	14.3	18.7	16.8	11.7	14.4
Long-Term Average	11.2	15.6	18.4	17.2	11.5	14.8
	Sunshine Hours					
Outlook	n/a	n/a	n/a	n/a	n/a	n/a
Saskatoon	249	268	299	297	206	264
Long-Term Average	285	299	333	295	188	280
	Frost Free Season					
Outlook	May 13 to September 23 = 133 days					
Saskatoon	May 30 to September 23 = 116 days					
Long-Term Average	121 days					

The 2000 cropping season appeared to be a typical prairie growing season however cool summer evenings and cloudy days may have slowed the development of some of the warm season crops. Unlike some eastern areas of Saskatchewan, Outlook and Saskatoon managed to escape a mid July frost event. Warm temperatures in early May coupled with a very dry spring enabled early seeding. Spring runoff and low spring precipitation levels demanded early irrigation to avoid seedling dessication. Mean daily temperatures were average throughout the growing season. Although maximum daily temperatures were average, the

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Saskatoon	10.7	14.6	16.4	17.8	10.3	14
Long-Term Average	11.2	15.6	18.4	17.2	11.5	14.8
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Saskatoon	10.5	14.3	18.7	16.8	11.7	14.4
Long-Term Average	11.2	15.6	18.4	17.2	11.5	14.8
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average minimum monthly temperature was 1 to 2°C below normal (with the exception of July).

The frost free season varied between the two research sites. Saskatoon had a late spring frost, reducing the length of the growing season by 20 days compared to Outlook. Although Outlook's frost free season was over 10 days longer than normal, crops did not appear to mature any sooner than in Saskatoon. Little frost damage was observed on any of the Saskatoon crops after this late spring frost. The cooler than average summer nights (1 - 2°C cooler than normal) appears to have affected crop growth. Total Saskatoon sunshine hours were below normal in May, June and July. August and September brought more typical sunshine hours. Below normal spring precipitation ensured early soil warming. July and August had slightly above normal precipitation levels. Lower than normal precipitation in September facilitated a steady fall harvest. Mother nature brought the growing season to an abrupt end on September 23rd with a killing frost of -4°C. At the beginning of October, temperatures averaging around -10°C for five consecutive nights terminated the season.

Insects/Disease

Unusually high humidity during the summer months appeared to encourage disease development in some crops. Preventative blight sprays were applied during the entire growing season to the potato crop. Late blight was present throughout the province. Some tomato fruit at the Saskatoon site showed symptoms of late blight. Tomatoes at both sites suffered some early blight and bacterial speck damage; severity varied with the cultivar. Snow peas were affected by downy mildew, bacterial blight and ascochyta later in the season. Severity was cultivar dependent. Gray mold and common blight affected most bean cultivars late in the growing season. Some celery cultivars exhibited unacceptable levels of aster yellows. Head lettuce was severely damaged by tip burn, grey mold and drop caused by Sclerotinia. In most cases, less than 25% of the lettuce heads were marketable. Several lettuce cultivars had no marketable heads.

Insect problems were minimal in 2000. Some plant death attributed to maggot infested root systems was noted later in the season in the oriental greens trial. Green bell peppers in the cover trial were severely infested by greenhouse aphids. Pepper plants, however, showed minimal damage and yields did not appear to be affected. Oriental green stands were reduced by root maggots. Flea beetles affected the quality of some of the oriental greens later in the season. Three daikon radish cultivars that were evaluated were completely unmarketable due to root maggot damage.

Yield/Quality

With a few exceptions, the quality of most of the crops tested was average or above average. Although the spring was dry, irrigation ensured that crops were off to a good start. At both sites, snow peas produced an excellent stand. With the exception of a few cultivars, most snow peas were relatively disease free until late in the season. Pod size varied between cultivars and flavour was acceptable.

Wax bean production in Saskatoon was excellent. The bean plot in Outlook however, lacked vigour and was later to mature than in Saskatoon. Average marketable bean yields in Outlook were only 30 % of those in Saskatoon. This lack of vigour in the Outlook bean plot has been observed in the past however no definitive explanation has been determined. Micronutrient deficiency has been the primary suspect for this lack of vigour.

Celery was transplanted very late in spring due to poor germination at seeding time. Despite the delay, the celery crop was beautiful and yields were excellent. In Saskatoon, all cultivars were harvested in a once over harvest at the end of September. The Outlook celery plot froze before any data could be taken.

Slicing cucumber yields were excellent. Unmarketable fruit yields were high as there was zero tolerance for scarring, yellowing, oversize or extreme fruit curvature. By fall frost, cucumber plants had, for the most part, finished producing.

The oriental greens plot examined many different types of greens. Stand establishment was cultivar dependent. Because of the many different types of greens that were evaluated, it was difficult to determine

the optimal harvest time for some cultivars. Bolting was cultivar specific with some cultivars being very resistant to bolting pressure while others bolted very early in the season. Some oriental green cultivars appear to be more suited to the prairie climate than other cultivars. The marketability of some of the oriental greens was affected by flea beetle damage later in the season. Due to maggot damage, none of the daikon radishes tested produced marketable roots.

Marketable head lettuce yields were poor at both sites. Tipburn, disease (gray mold and sclerotinia) and bolting reduced marketable yields significantly.

Garlic cloves were planted early in spring. Emergence and crop health was excellent for all cultivars. With the exception of the elephant garlic, all cultivars had died down by season end. Clove size and number of cloves per bulb was cultivar specific.

Several types of hot peppers were trialed, with a total of 85 cultivars grown for evaluation. All cultivars demonstrated excellent plant vigour. Green marketable yields were excellent. Some of the earlier maturing cultivars managed to produce high quality red fruit.

Mature green marketable yields for paste tomatoes were excellent. Few cultivars produced any significant number of mature red fruit. Grading standards were high. Undersize, scarred, marked or cracked fruit were considered unmarketable resulting in high unmarketable yields.

Sweet corn production appeared to be slow but steady throughout the growing season. Early in the growing season, a section of the Saskatoon corn plot was necrotic and stunted. The cause of this retarded growth was not determined. The affected area appeared to recover later in the season with no apparent long term damage. Of the 107 corn cultivars evaluated, only four cultivars failed to reach 50% harvest by the end of the season. The majority of the cultivars were completely finished producing by the first killing frost. Several corn cultivars exhibited sprouting cob tips. This phenomena has been observed in the past but not to the extent that it was during this growing season. The sprouts are small extensions of the tip of the cob and do not appear to affect the cob quality.

Onions harvested during the 1999 growing season were stored at 0°C, 80% R.H. from September, 1999 to June, 2000. Evaluations were made at four and eight months after storage. Storage quality was cultivar dependent.

The detailed data on performance of the various cultivars tested in 2000 are presented in the attached bulletin

SUMMARY AND CULTIVAR RECOMMENDATIONS

Basil

Most of the basil cultivars produced healthy, attractive plants useful for both culinary and ornamental value. Of the green-leafed types, 'Green Ruffles' and 'Italian Large Leaf' had excellent yields with strong basil aroma. 'Large Leaf Sweet' also had excellent yields however the aroma was not pleasant. 'Spicy Globe' had excellent yields and good ornamental value however the plants were difficult to deleaf. Of the purple-leafed types, 'Dark Opal' and 'Purple Ruffles' are recommended for appearance and leaf yield.

Beans

Beans were seeded in mid-May once soil temperatures had warmed to 15°C. Marketable yields were excellent at the Saskatoon site in 2000. The Outlook plot lacked vigour - yields were well below average. All cultivars were evaluated for yield, earliness, pod size and ease of picking. Eureka' and 'Gold Rush' are wax bean cultivars recommended for their earliness and excellent yields. 'Fruidor' and 'Golden Rocky' are later cultivars with large pods and excellent yields. 'Gold Mine' is recommended for its attractive pods and

good yields although it was more difficult to pick than most other cultivars. 'Nugget' is easy to pick and has excellent yields however the pod tips tend to be green.

Beets

Beets were direct seeded in early May and harvested in a once over harvest. All cultivars matured within 14 days of each other. Roots were graded into sizes with excessively small and oversize roots being considered unmarketable. Cultivars recommended for earliness and acceptable yields are 'Red Ace', 'Pablo', 'Scarlet Early' and 'Early Wonder. Cultivars recommended for their consistent high yields and acceptable quality are 'Rosette', 'Scarlet Early', 'PX1289' and 'Libero'. The standard cultivar 'Detroit Supreme' had good yields but tended to be bitter.

Cabbage

Cabbage cultivars were rated for their yield, density and core size. Cultivars recommended for their earliness are 'Fast Vantage', 'Dynamo', 'Pacifica', 'Parel' and 'Puma'. 'Dynamo' and 'Puma' had good numbers of small heads with excellent density. 'Pacifica' had the largest head size for an early variety. 'Zennith' and 'Greenstart' are earlier varieties with excellent yields and density. 'Minicole' is an attractive earlier variety with good density. 'Quartz' had good yields and density. 'Almanac' and 'Greenboy' had good head size and are recommended for their excellent early yields however head density was only average. Mid-season cultivars with a good head size and recommended for their excellent yields along with good density include 'Thunder Bay', 'Vantage Point' and 'Bobcat'. 'Survivor' and 'Gideon' are mid-season cultivars with good yields and density. Of the later mid-season cultivars, 'Cecile' had excellent quality and yield. 'Rio Verde' is recommended for its excellent yields in mid-season while 'Corsar' is a mid-season variety with good yields and a small core. 'Hercules' is a late variety recommended for its excellent yields.

Cantaloupe

The best early cantaloupe of good size with excellent yields, good taste and a high Brix sugar content was 'Earligold'. 'Athena' has excellent yields and taste but is slightly later. 'Scoop II' is recommended as a good tasting early variety however, fruit is small. 'Gold Rush', 'Earliqueen', 'Touchdown' and 'Alaska' all have good flavour and early yields however 'Earliqueen', 'Touchdown' and 'Alaska' tend to have a mushy texture. Recommended mid-season cultivars include 'Fastbreak' (excellent yield, good taste),'Carole' (excellent taste, average yield), 'Pulsar' (excellent yield, average taste), 'Super 45' (excellent taste, small fruit), 'Venice' (excellent yields, average taste) and 'Cesar' (good sweetness and yield),. 'Abondance' was the best charentais-type melon tested. 'Superstar' is recommended as an early honeydew.

Celery

The celery cultivars all matured in 1999 despite the short growing season but in 2000 many were immature at the final harvest. Cultivars were evaluated for their taste, visual quality and yields. Best overall cultivar based on taste, appearance and yield is 'Ventura'. **'Green Bay'**, **'Picador** and 'Utah 52-70' had excellent yields and good flavour. Celery cultivars recommended for their excellent flavour and acceptable yields are 'Victoria' and 'SSC-4' .

Corn

The corn cultivars were evaluated for earliness, taste, yields and quality. Average taste and yields did not vary between the three different types of corn tested (standard (su), sugar enhanced (se) and supersweet (sh2)).

Of the standard types, 'Sweet Rhythm', 'Seneca Horizon', has the best yields combined with good flavour.

Of the sugar enhanced varieties, 'Seneca Tomahawk', 'Bon Appetit', 'Delight' 'Seneca Spring' 'Jester II', and 'Seneca Dawn' are recommended for their earliness, yields and excellent flavour. 'Geronimo' 'Maple Sweet', 'Custer', 'Precocious' 'Summer Flavour' and 'Grant' are very early sugar enhanced varieties however, their cobs are small. 'Temptation' is a mid-season sugar enhanced variety with excellent taste and yields. 'Sunset', Sensor' and 'Wizard' are later maturing sugar enhanced varieties with yield and good taste. For those growers looking for a white sugar enhanced variety, 'Silver King' is recommended for its yield and taste. Late season sugar enhanced cultivars recommended for their excellent yields, taste and sweetness include 'Kandy King' and 'Precious Gem'.

Of the supersweet types, 'Princeton', 'Fresh Start' and 'Northern Supersweet' are the best early varieties. 'Northern Xtra Sweet', 'Extra Early Supersweet', 'Fortune', 'Accolade', 'Sweet Chorus', 'Seneca Tomahawk', 'Candy Corner', 'July Gem', 'Friendship', 'Eagle' and 'Sweet Rhythm' were relatively early and are recommended for good taste and yields. Late supersweet cultivars recommended for their combination of yields, flavour and sweetness include 'Impulse', 'Confection' and 'Madonna'.

Pickling Cucumbers

Cucumbers were given a rating based on their yields, taste and earliness. 'Morden Early' is the earliest cultivar, however, its yields were well below average at both sites. All other recommended cultivars reached peak maturity approximately one week later than 'Morden Early'. 'Cool Breeze' and 'Cross Country' are recommended for their earliness and excellent yields. 'Eureka', 'Gherkin', 'Spear It', 'Ultra Pak' and 'Wellington' are recommended for their excellent, consistent yields. 'Calypso', 'K Fir', 'Northern Dawn' and 'Patton Classic' had good yields. 'K Fir' is a long, narrow, spineless cultivar. 'Calypso', 'Eureka', 'Northern Dawn', 'Spear It', Fancipak and 'Wellington' tend to oversize between harvests. .

Slicing Cucumber

Direct seeded cucumbers were evaluated for earliness, yields, taste and quality. Cucumber fruit that was oversize, scarred, bent or yellow was considered unmarketable. 'Genuine' and 'Sweet Success' are the earliest cultivars. 'Genuine' has good flavour and yields. 'Sweet Success' has good flavour but a high gradeout. Cultivars recommended for their excellent yields and flavour include 'Lightning', 'Marketmore 76', 'Panther' and 'Raider'. Cultivars recommended for their good flavour and yields include 'Fanfare', 'Natsuhikari', 'Seneca Longbow', 'Superset', 'Ultrapak' and 'Vertige'.

Garlic

Nine garlic cultivars were planted early in the spring of 2000. 'Getz' and 'Silverskin' are recommended for their excellent bulb weight and number of bulbs per clove. 'Elephant' is recommended for its huge bulb and clove size. 'Elephant' is a late cultivar. All three recommended cultivars had very few unmarketable bulbs.

Head Lettuce

Head lettuce trials at both sites suffered severe yield losses due to early bolting, tip burn and head drop caused by sclerotinia. Although some cultivars performed better than others, no cultivars performed adequately to be recommended for commercial production. Cultivars were evaluated for yields, bolting, disease resistance, quality and flavour. 'Anchorage', 'General' and 'Tiber' are early cultivars recommended for their yields, head size and flavour. 'Summertime' and 'Gemini' had good consistent sweet flavour and average yields. 'Crispino' is recommended for its good yield and flavour however, it is susceptible to disease.

Romaine Lettuce

The romaine lettuce stand was excellent. Early plant thinning encouraged full, large head production.

'Grand Teton' had the best yield and taste combination. 'Medallion' had excellent yields with an average taste. 'BOS 503' was an attractive cultivar with excellent yields in Saskatoon and excellent taste. 'BOS 9003' was also an attractive cultivar with good yields but only average taste. 'Romulus', a red-leafed variety, is recommended for its good yields and taste.

Onions

Of the yellow varieties tested, 'Teton', 'Barrage', 'Norstar', 'Nice Pak' and 'Wolf' are recommended for their earliness and acceptable yields and quality. Later maturing cultivars with exceptional yields include; 'Vision', 'Hoopla', 'Yula', 'Yellow Globe Danvers', 'Frontier', 'First Edition', 'Candy', 'Spectrum' and 'Copra'. 'Candy', 'Yula', 'Festival', 'Hercules', and 'Prince', produced a large number of colossal bulbs.

Of the red varieties, Red Beauty' is the earliest cultivar tested which also had good yields. 'Mars' is recommended as the best early cultivar with consistent yields and large average bulb size. 'Red Burgermaster' is an attractive cultivar with excellent yields.

'Riverside Sweet Spanish' was the best Spanish onion tested, however, it was late.

'Clara' is recommended as the best early white cultivar tested with good yields. 'Clara' had a high number of doubles. 'Nevada' is a later white cultivar with fewer doubles and similar yields.

Storage Onions

Onions were stored at 0°C, 70% R.H. for 8 months. Quality was evaluated after four months and eight months of storage. Best yellow varieties for storage up to eight months are 'Prince', 'Yellow Globe Danvers', 'Torque', 'Copra', 'Cavalier', 'Mustang', 'Nice Pak GP and 'Cannon'. 'Yellow Globe Danvers' and "Copra' were also recommended for their high yields. 'Red Burgermaster' was the only red cultivar tested that exhibited excellent storage. None of the Spanish or white cultivars tested are recommended for storage.

Oriental Greens

Several types of oriental greens were seeded. Pac Choi types recommended for quality and yields include 'Brisk Green' and 'Joi Choi'. 'Brisk Green' plants are considerably smaller than 'Joi Choi'. All the cabbage types were attractive and performed well. 'Blues' and 'Yuki' have the best yields and flavour. Many of the greens that were trialed bolted early. 'Early Mizuna', 'Garland', 'Green Wave', 'Komatsuna Oriental Greens' and 'Tokyo Bell' are attractive greens with good flavour. Three Daikon radish cultivars were tested. All radish roots were maggot infested; few marketable roots were harvested.

Snow Pea

Snow peas were rated for earliness, yields, flavour and quality. 'Sugar Ann' is the best early cultivar with good flavour and excellent yields. 'Yuhsaya' is also early however its flavour is not as good as 'Sugar Ann' and the plants are susceptible to disease. 'Oregon Sugar Pod II' and 'Sugar Lace' have good yield and flavour. 'Oregon Giant' has excellent flavour however its yields are below average.

Parsnips

Parsnips were seeded in early May and harvested in late October. Total yield at each site was good however, marketable yields in Outlook were poor. 'Javelin' is recommended for its good marketable yields and sugars. 'Harris Model' is an attractive cultivar with good marketable yields. 'Primor' is also recommended for its good yields. 'New White Skin' is an attractive cultivar that had excellent yields in Saskatoon but poor yields in Outlook.

Hot Peppers

Most of the pepper cultivars tested produced marketable green peppers in both 1999 and 2000, but yields of ripe red fruit were highly variable. The use of field covers for most of the season promoted fruit maturity. 'Super Jumbo' 'Euro Sweet Banana and 'Hot Spot XR3' are banana-type pepper recommended for early yields and fruit quality. 'White Fire' was the hottest banana-type pepper tested. 'Of the cayenne type-peppers, e' 'First Prize', 'Viking' 'Magic Red' and Ring of Fire are all exceptionally hot with good to excellent yields. 'Golden Cayenne' and Yellow Midway have excellent early yields of yellow fruit. 'Cherry Bomb' (cherry-type) is recommended as early maturing, hot and flavorful.

'New Mexico Chili', 'Nour', 'Chili Grande' and 'Yellow Dagger' are early chili type peppers with good to excellent red yields and good marketable green yields. Their flavour is good but not very hot. Chili types recommended for their hot flavour and good yields include 'Hot King', 'Thai Dragon', 'Nostalgia' and 'Surefire'.

'Crimson Hot', 'Elegant Red' and 'Super Hungarian Hot' are cubanelle-type peppers recommended for their good flavour. Of these three cultivars, 'Crimson Hot' had the best yields.

Most of the jalapeño-type peppers tested performed well in the trial. Cultivars recommended for their flavour include, 'Mucho Nacho', 'Tampico Fiesta', 'Serrano Maximo', 'Jaladuro', 'Grande' 'Jalamex' 'Super Jumbo Jalapeño' is recommended for its large fruit size and good flavour. 'Delicias' is recommended for its good yields and excellent sweet taste.

Paste Tomatoes

In both seasons few cultivars produced significant numbers of red fruit. Cultivars were evaluated for earliness (based on red fruit production), marketable green yield, fruit size and quality. 'Elko, 'Monix', 'La Rossa', 'Mama Mia', 'Gibraltar 505', 'Capri', 'Classica', 'Daiquiri', 'Monix', 'Rocky', 'Roma VF' and 'Viva Italia', and 'Early Cascade' are recommended as early cultivars with good green marketable yields.

Watermelon

Watermelon fruit were harvested when the closest tendril to the fruit attachment was dry. In both test seasons, many of the cultivars failed to mature prior to the first killing frost. The best watermelon for early yield was 'Au Producer': but its taste was only average. 'Dulce Verde', 'Crimson Early', 'Ace King', 'Country Home', 'South Crimson' and 'Festival' are early with good fruit quality. 'Arriba', 'Piñata' and 'Sangria' were the best later season varieties: they are recommended for their excellent yields, good taste and fruit size. Late cultivars recommended for their excellent taste include 'Cham' (good yield) and 'Gal' (average yield). 'Ace Phoenix' is recommended as an early yellow fleshed cultivar with good yields and flavour.

Zucchini

Zucchini was seeded into black mulch in mid-May and reseeded in early June due to a late spring frost. Most cultivars recovered from the late seeding and produced prolific fruit. Of the green skinned types, 'H.N. Zucchini', 'Spacemiser', 'Chongma' and 'Ambassador' are recommended for their excellent yields. 'Excel' had excellent yields but tended to oversize between harvests. Of the yellow cultivars, 'Yellowjacket' and 'Yellow Zucchini' are recommended for their excellent yields. 'Golden Zucchini' is recommended for its appearance. 'Jemmy' is recommended for its excellent yields of green and yellow fruit.

Project Related Extension Activities for 1998 - 2001

February 1998 - trial results presented at Manitoba Horticulture Industry Days
February 1998 - trial summaries distributed to 300 + growers, industry stakeholders, seed supply companies, extension staff etc.
March 1998 - trial results presented at Nipawin Growers Meeting
April 1998 - trial results reviewed at Saskatchewan Vegetable Growers Annual Meeting
April 1998 - trial results presented at GardenScape
July 1998 - field plots toured as part of Cropportunities 1998.
August 1998 - Saskatchewan Irrigation Development Centre Field Day
September 1998 - field plots toured by four University programs
February 1999 - trial summaries distributed to 300 + growers, industry stakeholders, seed supply companies, extension staff etc.
February 1999 - trial results presented at Nipawin Growers Meeting
February 1999 - trial results reviewed at Saskatchewan Vegetable Growers Annual Meeting
April 1999 - trial results presented at GardenScape
July 1999 - field plots toured as part of Nipawin Grower Day.
August 1999 - Saskatchewan Irrigation Development Centre Field Day
January 2000 - trial results presented at Master Gardeners Conference
February 2000 - trial results presented to prospective growers in the Humboldt area
February 2000 - trial summaries distributed to 300 + growers, industry stakeholders, seed supply companies, extension staff etc.
March 2000 - trial results presented at Nipawin Growers Meeting
March 2000 - trial results reviewed at Saskatchewan Vegetable Growers Annual Meeting
April 2000 - trial results presented at GardenScape
July 2000 - field plots toured as part of Canadian Seed Growers Association Field day
August 2000 - Saskatchewan Irrigation Development Centre Field Day
September 2000 - field plots toured by two University programs
February 2001 - trial summaries distributed to 300 + growers, industry stakeholders, seed supply companies, extension staff etc.
February 2001 - trial results presented at grower meeting in Humboldt
February 2001 - trial reulst presented at grower meeting in Saskatoon
March 2001 - trial results presented at Nipawin Growers Meeting
March 2001 - trial results reviewed at Saskatchewan Vegetable Growers Annual Meeting
March 2001 - trial results presented at Gardenscape.